

A World First: Continuous Heat Treatment Processing for Steel Plates

JFE HOP Technology Enhances Utility of High-Performance Steel Plates

Steel plates, JFE Steel's signature product, are used for a wide variety of structures, including gas storage tanks, natural gas pipelines and machinery for construction and industrial use. JFE Steel was the first company in the world to develop and put to practical use processes for continuous steel plate manufacturing ("Super-OLAC" and "HOP"). Uniquely, even heat treatment is conducted continuously. In recognition of the vast improvements in productivity, energy-efficiency and delivery times realized by HOP, JFE Steel was honored with the highest award in the "2008 Prize for Promoting Machine Industry" by the Japan Society for the Promotion of Machine Industry.

HOP: Heat-treatment On-line Process

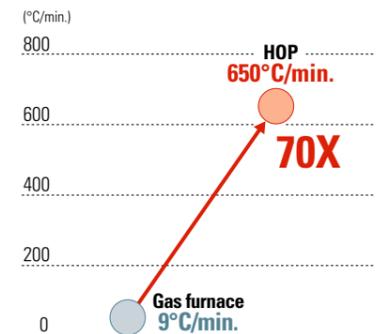


Engineers' Dream—Creating Continuous, Highly Efficient Heat Treatment Process

The trend toward larger plants and facilities, combined with efforts to cut fuel costs and CO₂ emissions, has stimulated demand for thin yet high-strength and easy-to-weld steel plates for use as basic construction materials. Heat treatment is critical to the manufacturing of high-strength steel plates and traditionally has been performed using gas furnaces. To date, however, the productivity of heat treatment has been approximately less than 1/20th that of hot rolling. As such, heat treatment was a barrier retarding the drive to improve the productivity of high-strength steel plates.

JFE Steel took up the challenge of developing a continuous, highly efficient heat treatment process, the dream of every engineer involved in the manufacturing of steel plates.

HOP Heating Rate

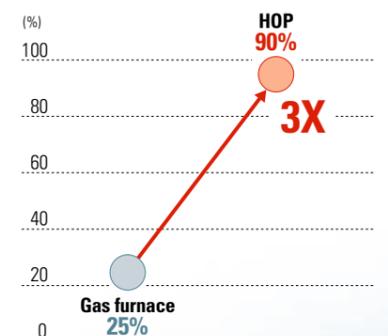


New Method with 70X Heating Rate (Productivity)

The greatest technical challenge in developing a continuous, highly efficient heating process was designing a high-efficiency facility that was as small as possible yet capable of processing steel plates at a level comparable to the hot rolling process. The solution, developed after much trial and error, is an extremely space-efficient induction heating unit capable of a heating rate 70 times faster than the traditional gas furnace.

The unit works according to the same principle employed in household electromagnetic cooktops. A steel plate is passed through a super-large electromagnetic coil and a current is applied to the coil, generating a magnetic field that heats the plate. This technology allows for shorter heating times, taking only 1 minute to reach 650°C and yielding an energy efficiency rate of 90% compared to 70 minutes and 25%, respectively, for the conventional method.

HOP Energy Efficiency



HOP Earns the Highest Award in "The 6th Prize for Promoting Machine Industry"

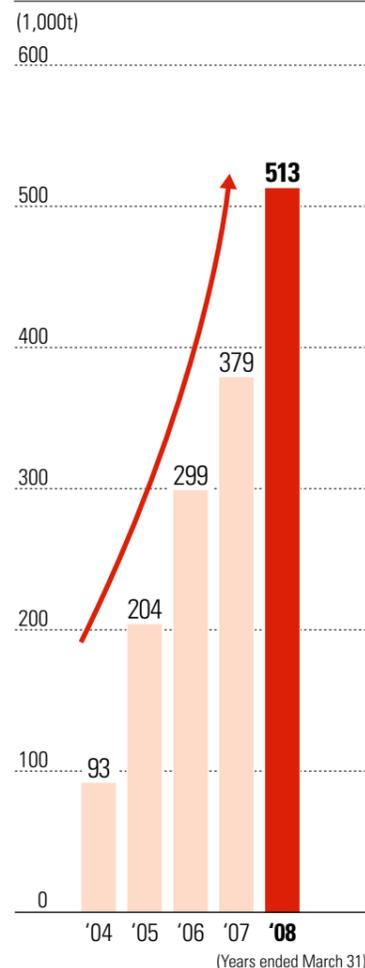
In January 2009, the Japan Society for the Promotion of Machine Industry presented JFE with its top prize, the Minister of Economy, Trade and Industry Prize at the 6th Promoting Machine Industry Awards for its HOP, or Heat-treatment On-line Process, for steel plates. HOP won high marks for uniqueness, innovation and economy. The event marked the first time that the Japan Society for the Promotion of Machine Industry recognized the JFE Group—not to mention the steelmaking industry—with this particular award.



TOPICS



Cumulative Steel Plate Production Using HOP Technology



Synthesizing Experience and Expertise to Develop World's First Continuous Heating Process

Many hurdles stood in the way of the development, but project members with expertise in fields like process and temperature control technology, material research and electronics acted swiftly and flexibly to solve problems one by one.

Their diligent efforts paid off when the world's first Heat-treatment On-line Process (HOP) for steel plates was realized in 2003. HOP is notable for its ability to heat plates as wide as 4.5 m and synchronize with hot rolling lines. This new technology enables mass production and stable supply of high-performance steel plates.

Translating "Only One" Technologies into Environmental and Product Value

— Energy efficiency, higher productivity, shorter delivery times —

JFE Steel's HOP technology uses a new approach to heating that yields significant energy savings and represents a meaningful step forward in preventing global warming. Furthermore, because the HOP process produces high-strength steel plates, customers can reduce their total steel consumption and reduce the weight of vehicles and machinery for construction sites, promoting energy efficiency and reducing CO₂ emissions.

HOP technology has also made possible a series of Only One and Number One products with greatly increased product value. Demand for environmentally friendly, high-performance JFE steel plates has risen rapidly in recent years. The numbers attest to the success of HOP technology: as of April 2009, JFE Steel has produced 500,000 tons of mainly tank, pipeline, and industrial machinery products using this process.

Looking ahead, JFE Steel will continue to deliver new value to customers and other stakeholders through its Only One and Number One technologies and products.

Examples of Only One Products Developed with Super-OLAC and HOP Technologies

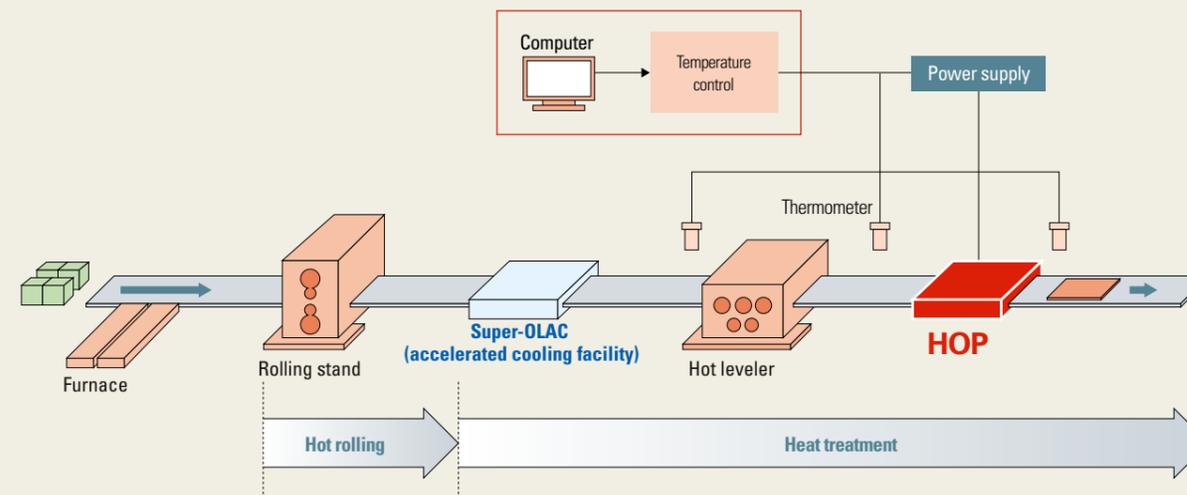
• JFE-HIPER — quake-resistant line pipe products

A new conceptual line pipe product "JFE-HIPER" is highly resistant to the localized wrinkling that can result from extraordinary axial and bending forces imposed by earthquakes and other phenomena, and is suitable for use in long-distance pipelines. Winner of the Iwatani Naoki Memorial Award (March 2008).

• JFE-HYD960LE and JFE-HYD1100LE — ultra-high-strength steel plate for use in construction and industrial machinery

JFE-HYD960LE and JFE-HYD1100LE are the first steel plate products to offer both ultra-high strength and exceptional fracture-resistance (toughness) and are perfect for use in construction and industrial machinery. Winners of the Japan Institute of Metals Technology Development Prize (September 2008).

Innovative Technologies Developed for HOP



POINT 1

Multiple Short Length Coil Alignment

To prevent degradation in material quality as a result of excessive surface heating, JFE Steel developed a system that employs separated multiple short-length coil alignments to gradually and stably heat steel plates to the desired temperature.

Patent No. 4066652

POINT 2

Reversible Plate Conveyor System

JFE Steel developed a reversible plate conveyor system that allows a steel plate to pass through the same heating coils multiple times, reducing both the amount of space required and energy consumed.

Patent No. 4062183
Patent No. 4066603

POINT 3

Temperature Control Technology

Temperature sensors were placed in various positions along the processing line to achieve precise temperature control of plates during processing. JFE Steel developed a high-precision temperature control system to manage processing time and electricity consumption and monitor steel plate surface temperatures. The system can achieve temperature control accuracy equal to, or even better than, the conventional one.

Patent No. 3945212



From right
 Minoru Suwa, Product Development
 Masatoshi Sugioka, Operating Technology
 Yoshimichi Hino, Process Development
 Tsunemi Wada, Steel Plate Division Manager
 Akira Tagane, Steel Plate Business Planning Manager

JFE Steel

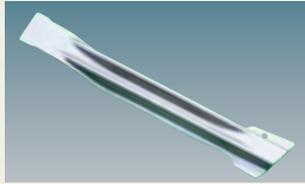
JAZ

Highly-lubricated automotive galvanized (GA) steel sheets



JFE-CA1180Y

Cold-rolled ultra-HITEN for use in automobile parts



HBL385

High-strength TMCP steel plate for construction applications



J-POCKET PILE

Cutoff steel sheet piles with pocket section



HISTORY steel tube

Steel tube for automobiles with high formability



Super Core

Electrical steel sheets for high-frequency applications



JFE443CT

Nickel- and molybdenum-free ferritic stainless steel with high corrosion resistance



Marine Block

Steel byproducts for remedial use in marine environments



Molybdenum Hybrid-Alloyed Steel Powder



JFE
Only One
Products

The JFE Group offers new value through Only One and Number One technologies and products.

NH48MV

Non-heat-treated large rods



JFE Steel Group Companies

Boron nitride



JFE Engineering

Wood Chip Biomass Gasification Plant (Licensed by Voelund)



KT Brace

Pin-ended circular hollow section bracing



Dual Scattered-Light Sludge Density Meter



CHS (Clathrate Hydrate Slurry) System

Clathrate hydrate slurry thermal energy storage air-conditioning system



Gas-Clean-DX

New activated carbon adsorption device



JFE Urban Development

THINK

Private sector-led science park



Universal Shipbuilding

Minesweeper



Icebreaker

"Shirase"



Kawasaki Microelectronics

10G EPON Burst Mode SerDes

ASIC products for fiber-optic networks

